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Natalia Maryniak

Global dairy industry is based mainly on the processing of milk from ruminants. The milk usually comes from dairy cattle such as cows or buffalos. The volume of such milk constitutes 96% of the total global milk production [1]. Camels are animals that also provide consumable milk, which is particularly known in Asia and Africa. Given their adaptability and good functioning in most climate conditions, camels can also be grown in the European climate.

Can camel milk become an alternative for cow milk?



Recently, producers seek alternative sources of cow or buffalo milk for the production of food for persons with allergies, including children in particular. Camel milk may be an alternative raw materials for making food for people suffering from allergies. Also, other properties of camel milk may contribute to a decision to source it in more locations all over the world.

Properties of camel milk

We may obviously compare the detailed composition and properties

of camel, cow and human milk, as presented in Table 1 below.

In reference to Table 1, the key differences between camel and cow milk should be noted. Compared to cow milk, camel milk usually has a lower fat and lactose content. It is also richer in such nutrients as potassium, iron or vitamin C [3]. Lower lactose content may make camel milk an adequate alternative to cow milk for those with lactose intolerance [4].

However, it seems the most important that camel milk may:

- support the health of people with diabetes;
- improve the general immunity;
- be an alternative to cow milk for people with allergy to cow milk protein;
- prevent hepatic steatosis (fatty liver).

When comparing camel milk with cow milk, it should be noted again that it may be less allergenic for people suffering from food allergies, which has been presented in more detail below. Cow's milk protein allergy (CMPA) is the most common allergy diagnosed in infants and children [5]. Most children

grow out of their allergy to cow milk protein before the age of 4. However, increasingly often, the allergy persists for all their lives. In such a case, the only solution is complete elimination of cow milk from the diet of infants and children [6]. The market offers plenty of hypoallergenic formulas for infants based on partial or total hydrolysis of cow milk proteins. There are also hypoallergenic formulas available that are solely based on a mixture of amino acids. They are a good alternative for infants and children allergic to cow milk, and at the same time reduce potential allergic reactions [7]. However, they will never eliminate allergic reactions completely. In addition, they have poor smell and may be bitter in taste, which may be repulsive for some infants and children. Given the above, there still is a need to find more alternatives to cow-

-milk-based hypoallergenic formulas for infants and children.

Because of its different composition of proteins and other ingredients compares to cow milk (Table 1), camel milk has recently become a point of interest among scientists and dairy producers. First of all, in contrast to cow milk, camel milk does not contain beta-lactoglobulin, a whey protein that is considered one of the main cow milk allergens. Differences in amino acid sequences and the properties of other proteins found in cow and camel milk suggest that camel milk may be less allergenic compared to cow milk and may become a promising alternative for children with CMPA. The research conducted so far provided that the cross-reactivity between proteins camel and cow's milk proteins is limited [8]. Such findings are a promising point

of departure for further studies on the usability of camel milk for infants and children with allergies to cow milk proteins.

There is a traditional perception that regular consumption of camel milk reduces insulin demand in diabetic patients and prevents the occurrence of the disease. Previous studies have shown that camel milk contains protein in its structure and features resembling insulin [9]. There are also speculations that this protein can pass through the digestive system up to the intestines and then be absorbed into bloodstream without compromising its structure [10]. The above theories have not been confirmed yet, however, research was conducted on a group of diabetic patients confirmed positive influence of camel milk consumption on the improvement of their health. Following

Table 1.
Comparison of
percentage composition
of the milk of selected
mammals
Source [2]

MILK	Water [%]	Lactose[%]	Total protein [%]	Fat [%]
Camel	88,1	4,4	3,1	3,5
Cow	87,3	4,8	3,4	3,7
Human	87,8	7,0	1,0	3,8

a year of consuming around 500 ml of camel milk every day, they were observed to have lower blood glucose levels, insulin antibodies and glycated haemoglobin [9]. In addition, their daily insulin demand decreased.

Products with camel milk available on the market

Camel milk is readily available commercially in Persian Gulf countries. Especially United Arab Emirates are

known for its production [11]. In Europe, production of camel milk is only in its infancy. There are farms in the Netherlands (<http://www.kamelenmelk.nl/en/>) and in the UK (<https://desertfarms.co.uk/>) that make camel milk. Also, Danish farmers are starting to consider establishing such businesses.

As already mentioned, camel milk is widely used in the industry at the UAE. This is rather not due to any special properties of the milk or its promotion in the country. Camel milk has been

a traditional food dating back to the Bedouin economy where only goat, sheep and also camel milk was widely consumed, also in processed forms.

Images 1–3 present different products such as fresh camel milk, *laban* – fermented dairy drink based on camel milk or recombinant natural or flavoured camel milk, which is also available on the Danish market. There is also a company in Poland that imports camel milk from the UAE (<http://mlekwielbladzie.pl/>). However, camel milk in the Danish and Polish markets is extremely expensive. A 250 ml PET bottle of camel milk on the Danish market costs 50 DKK, i.e. around PLN 30. However, 500 g of powdered camel milk on the Polish market costs PLN 330.

Camel milk has many nutrients valuable for the human health, however, compared to cow milk, it has a specific, sometimes sour taste and smell. It is for this reason that camel milk producers respond to consumer expectations and add various flavourings to it. At shop shelves in the United Arab Emirates, flavoured milks are available with added rose, date or cardamom syrups (**image 4**).

Key points

The global dairy products market is growing. Niche products stand a particular growth opportunity. Given their health promoting properties, dairy products based on fresh and processed camel milk are on an upward trend. In Europe, the camel milk products segment is only beginning to develop. An example of this is the commencement of camel husbandry and camel milk processing in the Netherlands and Denmark. The article was aimed at presenting the advantages of such products and raising interest among

potential Polish farmers and processors in making camel products in Poland.

As you can see, there are many scientific and technological issues still open in relation to camel milk. This should bring more and more findings, which – in turn – should promote camel milk as an increasingly sought and valuable food product and material, not only in the local Asian and African markets but also globally. The information on camel milk presented here should provide an impulse for establishing camel farms and production of camel milk in European countries, also hopefully in Poland.

To sum up and answer the question whether can camel milk become an alternative for cow milk: in Persian Gulf countries, it was cow milk that has become an alternative for camel milk. In European conditions, camel milk will not become an alternative for cow milk but it may become complementary to it in the nearest future.

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Acronyms:

- CMPA** – Cow's milk protein allergy
- DKK** – Danish Krone
- PET** – Polyethylen Terephthalate – a popular packaging material
- PLN** – Polish zloty
- UAE** – United Arab Emirates



Image 1.
Fresh camel milk in a PET bottle, product range at a UAE supermarket.
Source: Author's file

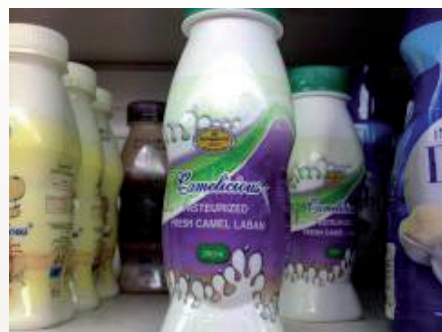


Image 2.
Laban made of camel milk, product range at a UAE supermarket.
Source: Author's file



Image 3.
Dairy products range made of camel milk at a shelf in Denmark.
Source: Author's file



Image 4.
Flavoured milk range made of fresh and recombinant camel milk, product range at a UAE supermarket.
Source: Author's file